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IS 15827 (2009): Plastic film for greenhouses [FAD 20: Agriculture and Food Processing Equipments]

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भारतीय मानक

ग्रीनहाउस के लिए प्लास्टिक फिल्म — विशिष्टि

Indian Standard

PLASTIC FILM FOR GREENHOUSES — SPECIFICATION

ICS 83.140.10; 65.060.30

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Agriculture and Food Processing Equipments Sectional Committee, FAD 20

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Agriculture and Food Processing Equipments Sectional Committee had been approved by the Food and Agriculture Division Council.

Greenhouses permit crop production using available sunlight through appropriate glazing materials, under atleast partially controlled environmental conditions. As a result, the crop productivity is several times enhanced compared to open field conditions, quality of the produce is superior, and the crop production is relatively independent of location and season. Greenhouses have also found use for hybrid seed production, biotechnological protocols, and agricultural research. Plastic films are the most common greenhouse glazing materials for commercial production activities. In view of the important role played by the plastic films in greenhouse crop production, it is essential that strict quality standards are laid down for use by greenhouse manufacturers, extension agencies and a processor. It is, therefore, proposed to include all the relevant information on plastic films, their mechanical, rheological and optical properties and test methods.

In the formulation of this standard considerable assistance has been derived from Indian Agricultural Research Institute, New Delhi and from prEN 13206 'Covering thermoplastic films for use in agriculture and horticulture' issued by the European Committee for Standardization (CEN).

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2:1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PLASTIC FILM FOR GREENHOUSES — SPECIFICATION

1 SCOPE

This standard specifies requirements and their methods of test for plastic films for greenhouse.

2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

IS No.	*Title*
2530 : 1963	Methods of test for polyethylene moulding materials and polyethylene compounds
13360 (Part 3/Sec 6) : 2000/ ISO 4591 : 1992	Plastics — Method of testing: Physical and dimensional properties; Section 6 Film and sheeting — Determination of average thickness of a sample, and average thickness and yield of a roll by gravimetric techniques (gravimetric thickness)
(Part 4/Sec 1) : 2000/ ISO 1133 : 1997	Theological properties, Section 1 Determination of the melt mass-flow rate (MFJ) and the melt volume-flow rate (MVR) of thermoplastics (*first revision*)
(Part 5/Sec 1) : 1996/ ISO 527-1 : 1993	Mechanical properties, Section 1 Determination of tensile properties – General principles
(Part 5/Sec 3) : 1996/ ISO 527-3 : 1995	Mechanical properties, Section 3 Determination of tensile properties — Test conditions for films and sheets
(Part 5/Sec 6): 1996/ ISO 7765-1 : 1988	Mechanical properties, Section 6 Determination of impact resistance by free falling dart method — Staircase method principles
13360 (Part 5/ Sec 10) : 1996/ ISO 6683-1 : 1983	Mechanical properties, Section 10 Determination of tear resistance of plastic films and sheeting — Trouser tear method
13360 (Part 9/ Sec 5) : 1999	Optical properties, Section 5 Determination of haze and luminous transmittance of transparent plastics.

3 TERMINOLOGY

3.1 Absorptance — Ability of a material to absorb energy.

3.2 Actual Yield — It is the area provided by given mass of a film of specified thickness.

3.3 Aging — Changes in a material due to time and environmental conditions, which degrade or improve it.

3.4 Burn Rate — The relative rate and/or extent and time of burning of plastics.

3.5 Coefficient of Expansion — The fractional change in length of a material for a unit change in temperature. That is, the number of mm expanded for each mm of total length when the temperatures rises by 1°C.

3.6 Composite — A plastic structure consisting of two or more different materials intimately mixed together.

3.7 Copolymer — A plastic made by mixing two or more monomers, which polymerize together.

3.8 Density — The mass of a material per cubic unit.

3.9 Diffuse Radiation — Solar radiation received from the sun after its direction has been changed by reflection and scattering by the atmosphere.

3.10 Elasticity — The tendency of a material to return to its natural size and shape after removal of deforming load.

3.11 Emittance — The giving off of energy by a material.

3.12 Elongation — The increase in length of a material being loaded in tension.

3.13 Extrusion — Forcing conditioned raw material through a die to form a continuous shaped product.

3.14 Flame-Resistive — Commonly, the property of materials that will improve its ability to resist ignition when exposed to flame.

3.15 Flash Point — The lowest temperature at which a substance in an open vessel gives off enough combustible vapours to produce momentary ignition when a small flame is passed near its surface.

3.16 Haze — The cloudiness in a transparent material or the portion of light that is not transmitted through a material in a straight line.

3.17 Ignition Temperature — The temperature at which a material will start burning without an external flame (self-ignition temperature) and/or the temperature at which a material ignites in the presence of external flame (flash ignition temperature).

3.18 Impact Resistance — An ability of the material to withstand a shock or sudden force.

3.19 Impact Strength — The ability to resist breakage by flexural shock.

3.20 Impact Failure Load — It is the load at which 50 percent of the specimens fail when tested by the impact resistance method.

3.21 Infrared — Light on the long wave end of the spectrum, which is invisible to the human eye but very penetrating. (Range — 780 nm to 1 000 000 nm).

3.22 Inhibitor — A substance that slows down and prevents chemical reaction.

3.23 K Factor (Thermal Conductivity) — This factor indicates the amount of heat transferred in unit time through unit area of homogeneous material of unit thickness with a unit temperature difference between its two surfaces.

3.24 Length of the Roll — The largest dimension of the roll, in mm.

3.25 Longitudinal Direction of the Roll (MD) — Parallel to the length of the roll corresponding to the extrusion direction.

3.26 Light Transmission — The percentage of light (energy) allowed to pass through a material.

3.27 Longevity — Usable life of glazing materials is defined as the number of months or years that a material will function effectively in commercial grower applications. To function effectively, it must retain some portion of its essential properties of strength and inherent light transmission (that part owing to internal chemical change as opposed to that part owing to external factors such as accumulated dust, dirt and the effects of corrosive atmospheres). In some materials, the decrease in light transmission, not loss of physical strength, determines the extent of useful life of glazing material.

3.28 Near Infrared Transmission — The percentage of energy in the near infrared (780 nm) of the thermal radiation allowed to pass through a material. This is part of the solar radiation, which adds to the heating of the greenhouse.

3.29 Nominal Width — The theoretically desired width of a film for a particular application. It is declared by the manufacturer in millimetres.

3.30 Nominal Thickness — The theoretically desired thickness of a film for particular application and is declared by the manufacturer in micrometers.

3.31 Photosynthetic Active Radiation — The visible portion of the spectrum from 400 nm to 700 nm regarded as being critical for proper plant growth and development. Comparative analysis of glazing materials' light transmitting properties must take into consideration the number of layers of glazing involved. Single layer glazing generally will have somewhat higher solar transmission than multilayer glazing.

3.32 Plasticizer — A chemical substance added to plastic to make it softer and more flexible.

3.33 Plastic Material — Plastic may be any of numerous organic, synthetic or processed materials that are moulded, cast, extruded, drawn or laminated into objects, films or filaments. At some stage of manufacturing process, all plastics are capable of flowing under heat and pressure, if necessary, into the desired final shape.

3.34 Polymer — A long-chain compound made up of many repeating units joined together chemically.

3.35 *R* Factor (Resistance) — It is the reciprocal of conductance (C). To determine the resistance of a material or area, divide the known thickness of the cross sectional area normal to the flow by the known conductivity K ($R = 1/C = t/K$).

3.36 Reflectance — Energy that has not been transmitted or absorbed.

3.37 Reinforcement — A strong material added to a base material to improve its strength, stiffness, and impact resistance. To be effective, the reinforcing material must form a strong bind with the base material.

3.38 Self-extinguishing — The ability of a material to cease burning when the source of flame has been removed.

3.39 Shading Coefficient — The ratio of solar heat gain through a glazing system under a specific set of conditions, to the solar heat gain through a single pane of double-strength sheet under the same set of conditions.

3.40 Shear Strength — The ability of a material to resist tearing.

3.41 Specific Gravity — The density (mass per unit volume) of a material divided by the density of water.

3.42 Tensile Strength — The ability of a material to resist being pulled apart.

3.43 Thermal Radiation — The radiation emitted by a body as a result of its temperature (that is, thermal motion of its electrons). The spread of thermal radiation spectrum is from microwaves to x-rays depending upon temperature of the object.

3.44 Transmission of solar energy — The percentage of total solar energy, which a material allows to pass through itself.

3.45 Total Solar Radiation — It includes the entire available energy spectrum emitted by the sun. It includes the major energy carrier in the near infrared waveband and is useful in calculating total energy gain in a greenhouse so that heating and cooling requirements can be calculated.

3.46 Transverse Direction of the Roll (TD) — The direction (parallel to the width) at right angles to the length.

3.47 Ultraviolet — It is invisible high energy radiation on the left hand of the solar spectrum, that is 100 nm-400 nm.

3.48 UV Absorbers — A chemical compound with the ability to selectively absorb UV radiation. When incorporated into plastics it reduces the degrading effects of ultraviolet energy.

3.49 Weathering — The effects on a material of outdoor exposure including water. UV radiation, oxidation, etc.

3.50 Weatherometer — An instrument used to subject materials to accelerated weathering conditions.

Example: Xenon Arc or EMMAQUA.

3.51 Width — It is total width of the film when laid flat, given in millimetres. (Films, which are wider than 2 000 mm, are usually wound on a reel and folded lengthwise at least once.)

3.51.1 *Nominal Width* — It is the theoretically desired width of the film for a particular application.

4 CLASSIFICATION OF PLASTIC FILMS

4.1 According to Use

For the purpose of this standard, according to their uses, the plastic films for greenhouses shall be classified as given in Table 1.

4.2 Classification Based on the Artificial Weathering Duration

The plastic films for greenhouses shall be classified as class N, A, B, C, D and E (*see* Table 2), depending on the time required to decrease the elongation at break to the 50 percent of the minimum value specified in Tables 3, 4 and 5 respectively for normal, thermic clear and diffusing films.

5 PLASTIC MATERIALS

5.1 Plastic films for greenhouses shall be manufactured from the following polymers:

a) Low density polyethylene (LDPE), linear low density polyethylene (LLDPE) and their blends.
b) Ethylene vinyl acetate copolymers (E/VAC) and their blends with LDPE or LLDPE.
c) Ethylene butyl-acrylate copolymers (E/BA) and their blends with LDPE or LLDPE.

Table 1 Characteristics and Use of Different Types of Plastic Film

(*Clause* 4.1)

Sl No. (1)	Type (2)	Characteristics (3)	Use (4)
i)	Normal plastics	a) Good transparency b) Low greenhouse effect	Forcing and semi-forcing crops
ii)	Thermic clear plastics	a) Good transparency b) High IR effectiveness	As normal film, when greater IR effectiveness is desired
iii)	Thermic diffusing plastics	a) Diffusing light b) High IR effectiveness	As normal film, when greater IR effectiveness and diffusing light is desired

5.2 When tested in accordance with IS 13360 (Part 4/ Sec 1), the Melt Flow Rate (MFR) of the polymers shall not be more than 0.3 g/10 min for LDPE and 1.1 g/10 min for LLDPE.

5.3 When tested in accordance with IS 2530, the density of the raw material shall not be less than 0.912 g/cm^3.

6 REQUIREMENTS

6.1 Appearance

The film shall be uniform in colour, texture and finish. The film shall be free from pinholes and undispersed raw materials, streaks and particles of foreign matter. There shall be no other visible defects, such as holes,

Table 2 Classification of Covering Films on the Basis of Artificial Weathering Duration

(*Clause* 4.2)

Sl No. (1)	Class of Film (2)	Duration (3)
i)	N	≥ 400
ii)	A	1 700
iii)	B	3 200
iv)	C	4 600
v)	D	6 000
vi)	E	≥ 7 300

tears or blisters. The edges shall be free from nicks and cuts visible to unaided eye.

6.2 Melt Flow Rate

The Melt Flow Rate (MFR) of the film when determined in accordance with IS 13360 (Part 4/Sec 1) shall not be more than ± 20 percent of that of polymer as specified in **5.2**.

6.3 Durability (Resistance to Artificial Weathering)

The duration of a covering film shall be declared by the manufacturer and is determined by testing the variation of its elongation at break after accelerated weathering according to the method given in **7.5**.

The duration shall be in accordance with the declared class if test results conform to the requirement given in **7.5.5**.

6.4 Specific requirements of normal, thermic clear and thermic diffusing films shall be as given in Tables 3, 4 and 5 respectively.

7 TEST METHODS

7.1 Appearance

The free edges of the role shall be sealed with adhesive

Table 3 Requirements for Normal Film

(*Clauses* 4.2 *and* 6.4)

Sl No.	Requirements	Thickness of the Film, μm							Test Method, Ref to
		50-69	70-79	80-99	100-149	150-179	180-199	200 and Above	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	Average thickness tolerance *versus* nominal, percent	± 5	± 5	± 5	± 5	± 5	± 5	±5	IS 13360 (Part 3/Sec 6)
ii)	Point to point thickness *versus* nominal, percent	–15	– 15	– 15	– 15	– 15	- 15	–15	IS 13360 (Part 3/Sec 6)
iii)	Width tolerance *versus* nominal, percent	+ 4	+ 4	+ 4	+ 4	+ 4	+ 4	+ 4	*See* **7.2**
iv)	Tensile strength at break (MD+TD) (*Min*), Mpa	17	17	17	17	17	17	17	IS 13360 (Part 5/Sec 3)
v)	Elongation at break (MD + TD) (*Min*), percent	180	180	200	250	300	400	400	IS 13360 (Part 5/Sec 3)
vi)	Dart drop test on flat sheet (*Min*), CN	90	120	140	200	300	350	400	IS 13360 (Part5/Sec 6)
vii)	Total visible light transmittance (*Min*), percent	88	88	88	88	88	86	86	13360 (Part 9/Sec 5)
viii)	Haze (*Max*), percent	30	30	30	35	35	35	35	13360 (Part 9/Sec 5)
ix)	Tear strength	—	—	—	—	—	—	—	13360 (Part 5/Sec 10)

Table 4 Requirements for Thermic Clear Film

(*Clauses* 4.2 *and* 6.4)

Sl No.	Requirements	Thickness of the Film, μm						Test Method, Ref to
		70-79	80-99	100-149	150-179	180-199	200 and Above	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Average thickness tolerance *versus* nominal, percent	± 5	± 5	± 5	± 5	± 5	± 5	IS 13360 (Part 3/Sec 6)
ii)	Point to point thickness *versus* nominal, percent	– 15	– 15	– 15	– 15	– 15	– 15	IS 13360 (Part 3/Sec 6)
iii)	Width tolerance *versus* nominal	+ 4	+ 4	+ 4	+ 4	+ 4	+ 4	*See* **7.2**
iv)	Tensile strength at break (MD+TD) (*Min*), Mpa	19	19	19	19	19	19	IS 13360(Part 5/Sec 3)
v)	Elongation at break (MD + TD) (*Min*), percent	400	400	400	400	500	500	IS 13360(Part 5/Sec 3)
vi)	Dart drop test on flat sheet (*Min*), cN	240	240	350	550	650	650	IS 13360 (Part 5/Sec 6)
vii)	Elongation under a steady load (*Min*), percent	NA	NA	30	30	30	30	*See* **7.3**
viii)	Total visible light transmittance (*Min*), percent	89	89	89	89	87	87	13360 (Part 9/Sec 5)
ix)	Haze (*Max*), percent	25	25	25	35	35	35	13360 (Part 9/Sec 5)
x)	IR effectiveness (*Min*), percent	55	55	65	75	75	75	*See* **7.4**
xi)	Tear strength	—	—	—	—	—	—	13360 (Part 5/Sec 10)

Table 5 Requirements for Thermic Diffusion Film

(*Clauses* 4.2 *and* 6.4)

Sl No.	Requirements	Thickness of the Film, µm						Method of Test, Ref to
		70-79	80-99	100-149	150-179	180-199	200 and Above	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Average thickness tolerance *versus* nominal, percent	± 5	± 5	± 5	± 5	± 5	± 5	IS 13360 (Part 3/Sec 6)
ii)	Point to point thickness *versus* nominal, percent	–15	–15	–15	–15	–15	–15	IS 13360 (Part 3/Sec 6)
iii)	Width tolerance *versus* nominal	+4	+4	+4	+4	+4	+4	*See* **7.2**
iv)	Tensile strength at break (MD+TD) (*Min*), Mpa	16	16	16	16	16	16	IS 13360 (Part 5/Sec 3)
v)	Elongation at break (MD + TD) (*Min*), percent	180	200	250	300	400	400	IS 13360 (Part 5/Sec 3)
vi)	Dart drop test on flat sheet (*Min*), cN	120	140	200	300	350	400	IS 13360 (Part 5/Sec 6)
vii)	Elongation under a steady load (*Min*), percent	NA	NA	30	30	30	30	*See* **7.3**
viii)	Total visible light transmittance (*Min*), percent	85	85	85	80	80	80	13360 (Part 9/Sec 5)
ix)	Haze (*Max*), percent	30	30	35	35	35	35	13360 (Part 9/Sec 5)
x)	IR effectiveness (*Min*), percent	60	65	70	75	75	75	*See* **7.4**
xi)	Tear strength	—	—	—	—	—	—	13360 (Part 5/Sec 10)

tape or by some other similar means, in order to prevent its unwinding. The edges should be properly in line and there should be sufficient tension to prevent the layer of the roll from transverse slipping when it is handled (this should be done horizontally). The film shall be checked by unrolling at least 2 m of the film and examining it against the light at arms length.

7.2 Determination of Width

7.2.1 Unroll the film or sheeting into lap form in such a way that the length of each lap does not exceed 5 m, and that there are no more than twenty laps directly one above the other. Allow the material in the lap form for at least 1 h before the measurements are made. In case of non-rolled samples, 30 min conditioning is sufficient.

7.2.2 Lay the film on a flat surface having about 10 m length and at least as wide as the film to be measured. Place the scale subdivided into 1 mm divisions on the film in such a manner that it is at right angles to the length direction of the film, with zero mark on the scale aligned squarely with the left longitudinal edge of the film. Determine the exact position of the right edge of the material on the scale to the nearest 1 mm and record the result.

7.2.3 The number of measurements to be made depends on the overall length of the roll or sample to be inspected. For length upto 5 m, determine the width at least three times along the sample length at approximately equal intervals. For length longer than 5 m, determine the width at least ten times along the length at approximately equal intervals.

7.2.4 Record the width measured and report the arithmetic mean as the average width of the roll or sample. However for actual use, the smallest width be considered if one piece material is to be used.

7.3 Elongation Under a Steady Load (Creep Test)

7.3.1 *Principle*

To measure the elongation of a film under a stated load after a fixed time in a vertical static position.

7.3.2 *Apparatus*

Two grips hold the test specimen. A weight is hung to the lower (free) grip to provide a steady stress in the specimen. The upper grip is clamped to a fixed support:

7.3.3 *Operative Conditions*

The test shall be done on 3 specimens cut from the film in the machine direction (MD).

7.3.3.1 *Dimension of the specimen*

a) *Width*: 10 mm,
b) *Total length*: 140 mm, and
c) *Gauge length defined between two marks:* 100 mm.

7.3.3.2 *Test conditions*

a) *Test temperature:* 27 ± 2°C,
b) *Load to be applied:* 4 Mpa, and
c) *Duration of test:* 100 h.

7.3.4 *Procedure*

Place the test specimen on which the gauge length of 100 mm has been marked, in the grips. Calculate the weight which is needed for the test with reference to the minimum cross-section of the specimen, and adjust the test weight to this value (for example by adding or removing lead shot to the weight). Carefully hang the system, grips — specimen — weight to the fixed support, avoiding jerks and shocks.

NOTE — During the test the apparatus shall not be subjected to vibration or shocks which may influence the final measurement. Maintenance and temperature during entire period of test be ensured.

7.3.5 *Results*

The results are expressed as the strain of the sample as a percentage of the original length.

$$A = \frac{L - L_i}{L_i} \times 100$$

where

A = value of the creep;

L_i = initial gauge length, in mm; and

L = arithmetic mean of the medium final distance between the two marks that define the gauge length of each specimen.

7.4 IR Effectiveness — Barrier Against Thermic Radiation

7.4.1 *Principle*

The method consists of measuring the IR transmission spectrum of thermic film within wave numbers ranging from 1 430 cm^{-1} to 770 cm^{-1} (between 7 μm and 13 μm wavelengths).

This range of wavelengths corresponds to the field of maximum emission of the energy radiated by the earth's surface.

7.4.2 *Apparatus*

Infrared spectrophotometer with a recorder. Analytical balance with a 0.1 mg margin of error or planimeter.

7.4.3 *Procedure*

The measurement shall be done on 5 specimens taken from the film under test. Put each specimen to be checked on the specimen holder of the spectrophotometer and record the spectrum of transmission from 1 430 cm^{-1} to 770 cm^{-1}.

Measure the area between 100 percent transmittance and the curve of the spectrum with the help of a planimeter or by using the weighing method given in **7.4.3.1**.

7.4.3.1 *Weighing method*

Cut a sheet bearing the trace of the spectrum (or a copy of it) at 1 430 cm^{-1} and 770 cm^{-1} and along the lines of 0 percent and 100 percent transmittance. Weigh this rectangle to an accuracy of 0.1 mg. This mass shall be stated as P_{100}. Then cut along the outline of the spectrum and weigh the part representing the transmission. This second mass shall be stated as P_t.

7.4.4 *Setting Out the Results*

7.4.4.1 *Planimeter method*

The percentage of the measured area of the spectrum in respect to the total area is the value of the IR effectiveness.

7.4.4.2 *Weighing method*

The IR absorption in the range of wavelengths between 7 to 13 mm is given by the following formula:

$$\mathrm{IR}_{\mathrm{effectiveness}} = \frac{P_{100} - P_t}{P_{100}} \times 100$$

7.5 Resistance to Artificial Weathering

7.5.1 *Principle*

This measurement involves determining the variation of tensile strain at break of the film after exposure to a Xenon arc light source that simulates the spectral power distribution of solar light in accordance with IS 13360 (Part 9/Sec 5). Depending on the artificial weathering, the covering films are classified in 6 categories, from N to E (*see* Table 2).

A sample of the films irradiated according to **7.5.3** for the time corresponding to the specified class (*see* Table 2). After irradiation, the tensile strain is determined on five rectangular specimens, 10 mm wide and 150 mm long taken longitudinally (MD), according to IS 13360 (Part 5/Sec 3).

7.5.2 *Apparatus*

The apparatus shall consist of Xenon arc sources with a double filter borosilicate for simulating the direct sunlight [*see* IS 13360 (Part 9/Sec 5)].

7.5.3 *Test Conditions*

a) The irradiance at the wave length of 340 nm shall be fixed at 0.35 W/m^2 nm. In this condition the irradiance in the visible range (300 nm to 800 nm) should be about 400 W/m^2,
b) Spray cycle:
    1) duration of spraying: 18 ± 0.5 min,
    2) dry interval between spraying: 102 ± 0.5 min,
c) Black standard temperature (65 ± 3°C), and
d) Relative humidity (65 ± 5 percent).

7.5.4 *Procedure*

A sample of film is irradiated according to **7.5.3** for the time corresponding to the class of the Table 2.

After irradiation, the tensile strain at break shall be determined according to IS 13360 (Part 5/Sec 3), using test specimens Type 2, 10 mm wide, taken longitudinally (MD) with a speed of 500 mm/min in accordance with the test procedure given in IS 13360 (Part 5/Sec 1).

7.5.5 *Results*

The arithmetic mean of the 5 measurements is calculated, and compared to the value of the tensile strain at break of Tables 3, 4 or 5 depending on the type and thickness of the film. The duration is in accordance with the considered class when the arithmetic mean is equal or greater than 50 percent of the value given in Tables 3, 4 and 5.

8 MARKING

8.1 Each roll/folded film shall be indelibly marked with the following information:

a) Manufacturer's name and recognized trade-mark, if any;
b) Class of the film (*see* Table 2);
c) Type of basic polymer (PE-LD, PE-LLD, etc);
d) Width of the roll/folded film;
e) Mass of the roll/folded film;
f) Thickness of the film; and
g) Batch number and date of manufacture.

8.2 BIS Certification Marking

Each roll/folded films may also be marked with the BIS Standard Mark.

8.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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Bureau of Indian Standards

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

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Amendments Issued Since Publication

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